

## Claims

1. A solid state single mode distributed feedback (DFB) laser (1), comprising a laser waveguide (10), a DFB grating structure (6) optically coupled to the waveguide (10). for  
5 stabilising the wavelength of optical radiation (7) in the waveguide (10), one or more current conduction regions (4',4'') for guiding an applied electrical current to pump the laser waveguide (10) and at least one current constriction  
10 region (40) adjacent said one or more current conduction regions (4',4''), said DFB structure (6) extending in said current constriction region (40) and at least one of said current conduction regions (4',4''), wherein the current conduction and constriction regions (4',4'',40) are arranged  
15 so that an electrical current (34) applied to the current conduction region(s) (4',4'') pumps the laser waveguide (10) preferentially in said one or more current conduction regions (4',4'') compared with the electrical constriction region (40) and thus varies the effective index of refraction (38) of the  
20 laser waveguide (10) in said regions (4',4'',40) in order to stabilise said optical radiation (7) for single mode operation of the laser (1).
2. A DFB laser (1) as claimed in Claim 1, in which the DFB  
25 structure (6) is based on a regular periodic array of partially reflective features.
3. A DFB laser (1) as claimed in Claim 1 or Claim 2, in which the current constriction region (40) is ion implanted  
30 to increase the electrical resistivity of the current constriction region (40) relative to said adjacent current conduction region (4',4'').

4. A DFB laser (1) as claimed in Claim 1 or Claim 2, in which the current conduction region (4',4'') is formed from one or more semiconductor layers (12,24,26) deposited above the laser waveguide (10), at least one of said deposited layers (26) not extending over the current constriction region (40).

5. A DFB laser (1) as claimed in any preceding claim, including one or more electrical contacts (30',30'') for applying said electrical current (34), in which said one or more contacts (30',30'') extend over the current conduction regions (4',4'') but not over said current constriction region (40).

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6. A DFB laser (1) as claimed in any preceding claim, in which one current constriction region (40) lies between two adjacent current conduction regions (4',4'').

20 7. A DFB laser (1) as claimed in Claim 6 when appendant from Claim 5, in which both of said two adjacent current conduction regions (4',4'') have an electrical contact (30',30'') for applying said current (34).

25 8. A DFB laser (1) as claimed in Claim 7, in which said two electrical contacts (30',30'') are in direct electrical connection.

9. A method of forming a solid state single mode distributed feedback (DFB) laser (1), said laser having a semiconductor substrate (2) and a plurality of layers (8,10,12,17,18,19,24,26) deposited above said substrate, the

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method comprising the steps of forming in said deposited layers:

a) a laser waveguide (10);

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b) one or more current conduction regions (4',4'') above said laser waveguide (10) for guiding an applied electrical current (34) to pump the laser waveguide (10);

10 c) at least one current constriction region (40) above said laser waveguide (10) and adjacent said one or more current conduction regions (4',4'');

15 d) a DFB grating structure (6) optically coupled to the waveguide (10) for stabilising the wavelength of optical radiation (7) in said waveguide (10), said structure extending in said current constriction region (40) and at least one of said current conduction regions (4',4'');

20 wherein said one or more current conduction regions (4',4'') and said at least one current constriction region (40) have the characteristic that electrical current (34) applied to said current conduction region(s) pumps the laser waveguide (10) preferentially in said one or more current conduction  
25 regions (4',4'') compared with said at least one electrical constriction region (40) in order to vary the effective index of refraction (38) of the laser waveguide (10) in said regions (4',4'',40) in order to stabilise said optical radiation (7) for single mode operation of the laser (1).

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10. A method of operating a solid state distributed feedback (DFB) laser (1), said laser having a laser waveguide (10), a

DFB grating structure (6) optically coupled to the waveguide (10) for stabilising the wavelength of optical radiation (7) in the waveguide (10), one or more current conduction regions (4',4'') for guiding an applied electrical current (34) to  
5 pump the laser (1), the current conduction region(s) (4',4'') extending only within a portion of the DFB grating structure (6), wherein the method comprises applying through said one or more current conduction regions (4',4'') an electrical current (34) to pump the laser waveguide (10) unevenly with  
10 respect to the extent of the DFB structure (6) and thus vary the effective index of refraction (38) of the laser waveguide (10) in order to stabilise said optical radiation (7) for single mode operation of the laser (1).

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